Supreme Court of the United States.

OCTOBER TERM, A. D. 1900.

No. 277.

UNITED STATES REPAIR & GUARANTY COMPANY,
Petitioner,

vs.

ASSYRIAN ASPHALT COMPANY,
Respondent.

BRIEF FOR PETITIONER.

STATEMENT OF THE CASE.

This is a suit in equity by the petitioner, entered in the United States Circuit Court for the Northern District of Illinois, June 12, 1897, praying an injunction and account against the respondent and one James P. Mallette, for the infringement of three several letters patent issued to A. H. Perkins and duly assigned to the petitioner. The earliest of said patents was No. 501,537, dated June 18, 1893, for "*Method of Repairing Asphalt Pavements;*" the second, No. 542,349, dated July 9th, 1895, for "Improvements in Apparatus for Repairing Asphalt Pavements;" and the third and latest, No. 560,599, dated May 19, 1896, for "Improvements in Apparatus for Repairing Asphalt Pavements." The respondent answered the bill of complaint, and, after replication was filed and various minor

proceedings had, the parties took their proofs at large, including a full presentation of the prior art, both here and abroad. Pending these proceedings, the petitioner dismissed its bill as to patent No. 542,349, and asked for a decree only on Nos. 501,537 and 560,599. On these two patents, the suit came to hearing and rehearing before Judge KOHLSAAT in May and June, 1899, and, on July 27, 1899, his Honor entered a decree dismissing the bill as to James P. Mallette, granting an injunction and account as to patent No. 560,599, holding the process patent, No. 501,537, invalid and void, because anticipated by the French patent of Paul Crochet, No. 137,208, dated June 11, 1880, and therefore dismissing the bill as to that patent. The defendant did not appeal.

The petitioner immediately prayed an appeal to the Circuit Court of Appeals of the Seventh Circuit as to so much and such parts of Judge KOHLSAAT's decree as refused the injunction prayed for against the Assyrian Asphalt Company under the process patent No. 501,537. In January, 1900, the case on appeal was argued for both parties, and on April 16, 1900, the Circuit Court of Appeals affirmed the decree of the Circuit Court with costs.

In May, 1900, the petitioner presented its petition to this Honorable Court, praying a writ of certiorari to the Circuit Court of Appeals for the Seventh Circuit, in order to obtain the decision of this court upon the matter in controversy, namely, the validity of the Perkins process patent, No. 501,537; and this petition was granted May 21, 1900.

The opinions filed by Judge KOHLSAAT and the Circuit Court of Appeals for the Seventh Circuit will be found in the Transcript, pages 526, 529, respectively.

In an appendix to the printed petition for certiorari (see also 37 C. C. A., 28, and 59 Fed., 137), there will be

found a copy of the opinion of the Circuit Court of Appeals for the Second Circuit in the suit of this petitioner *vs.* Standard Paving Company, upon the claim of the Perkins patent here in controversy, wherein that court expressed its opinion that said patent was not anticipated by the French patent of Crochet; so that, as the case stands, there is a decree of the Court of Appeals for the Seventh Circuit holding said patent invalid by reason of the prior Crochet patent, and an opinion of the Circuit Court of Appeals of the Second Circuit holding said patent valid notwithstanding the prior Crochet patent.

The assignment of errors upon which the Circuit Court of Appeals for the Seventh Circuit acted in the present case will be found on pp. 434, 435, of the Transcript, and will be seen to raise particularly the question whether the Perkins process patent, No. 501,537, was anticipated by said Crochet patent.

In brief, this case now comes before your Honors squarely upon the single question whether the court at Chicago, or the court at New York, was right as to the effect of said French patent upon the validity of the Perkins patent here in suit. This question can be determined only by comparing the two patents, in view of the state of the art at the time of their issue, and particularly in view of the important, and, as we submit, decisive, fact that the word "asphalt," used in both, *had one meaning in the pavement art in France, and another and very different meaning in the same art in America.* These two different meanings are of the utmost significance, and they should be not only understood, but thoroughly realized before proceeding to compare the two patents. We will, therefore, discuss them at this point, after having preliminarily called attention to—

TWO LEGAL PRINCIPLES ESTABLISHED BY THIS COURT.

1.

Courts base their decisions not upon words, but upon the idea represented by the word; it is not the sign, but the thing signified, that controls their conclusions. This principle is well illustrated in *The Bridge Proprietors* v. *The Hoboken Company*, 1 Wall., 116. In that case, the State of New Jersey, in 1790, had granted to the complainants, for the term of ninety-nine years, the exclusive right to build and operate *bridges* over the Passaic and Hackensack Rivers, within certain territorial limits. In 1860, the defendant constructed a railroad bridge over the Hackensack River within said limits. The complainant brought suit to restrain this construction, and the case went up to the Supreme Court of the United States, which dismissed the bill on the ground that a railroad bridge was not a *bridge* within the meaning of the New Jersey charter, it being a structure very different from those known in 1790, and therefore not within the contemplation of the legislature when it granted that charter. In delivering the opinion of the court, Mr. Justice MILLER said (p. 147):

> "In all the departments of knowledge, it has been a constant source of perplexity to those who have attempted to reduce discoveries and inventions to scientific rules and classifications, that old terms, with well defined meanings, have been applied so often to things totally new, either in their essence or in their combination. It is to avoid the danger of being misled by the use of a term well understood before, but which is a very poor representative of the new idea desired to be conveyed, that our modern science is enriched with so many terms, compounded of Greek and Latin words, or parts of words. It does not follow, that when a newly invented or discovered thing is called

> by some familiar word, which comes nearest to expressing the new idea, that the thing so styled is really the thing formerly meant by the familiar word."

And, in conclusion, he stated that the majority of the court were "satisfied that sound principle and the weight of authority" were with the defendant, citing other cases to the same effect.

2.

In *Meyer et al* v. *Arthur*, 91 U. S., 570, 577 (second line from top of page), this court held that—

> "Any substance subjected to a chemical change by uniting with another substance loses its identity; it becomes a different mineral species."

And again, just below the passage quoted, Mr. Justice BRADLEY adverts to the fact that the poverty of the language often occasions the use of inadequate chemical terms in an incorrect sense.

ASPHALT.

Bearing these two principles in mind, let us compare the Perkins and Crochet patents.

We observe at once that Crochet, writing in France, in June, 1880, stated the title of his patent as "a process for the repair and recharging of *compressed asphalt* roadways," and elsewhere, throughout the patent, speaks of the pavements to which his process is to be applied as *"asphalt"* pavements; and that Perkins, writing in the United States, in March, 1893, uses the same term, *"asphalt,"* to describe the pavements in use at that date in this country, which are to be repaired by his process.

Now, both of these patents were scientifically incorrect in the use of this nomenclature. No pavement ever was, or ever will be, constructed of asphalt, for it is totally un-

fit for such purpose. The word "asphalt," until it became corrupted by recent use in connection with the art of paving, meant simply *native bitumen*, and is described in Webster's Dictionary, edition of 1828, as follows:

> "ASPHALT
> "ASPHALTUM. } Judaicum, Jew's pitch; a smooth, hard, brittle, black or brown substance, which breaks with a polish, melts easily when heated, and when pure, burns without leaving any ashes. It has little taste, and scarcely any smell, unless heated, when it emits a strong smell of pitch.
>
> "It is found in a soft or liquid state on the surface of the Dead Sea, which, from this substance, is called Asphaltites, or the Asphaltic Lake. It is found also in the earth, in many parts of Asia, Europe and America. Formerly, it was used for embalming dead bodies; the solid asphalt is still employed in Arabia, Egypt, and Persia, instead of pitch for ships; and the fluid asphalt is used for varnishing, and for burning in lamps. A species found in Neufchatel is found excellent as a cement for walls and pavements; very durable in air, and not penetrable by water.* A composition of asphalt, lamp black and oil is used for drawing black figures on dial-plates. *Encyc. Nicholson.*"

In the 1864 edition of the same dictionary (nine years after asphaltic substances had come into use for pavements), asphalt is defined and described as follows:

> "1. Mineral pitch, Jews' pitch, or compact native bitumen. It is brittle, of a black or brown color and high luster on a surface of fracture; it melts and burns when heated, leaving no residue. . . . See *Bitumen.*"

Worcester, Unab. Dict., edition of 1860, defines and describes it as—

> "Compact native bitumen, or mineral pitch. It is

* This does not refer to the use of Neufchatel *rock* for pavements, but only to bitumen extracted from it, and used to cement paving blocks together.

black or dark brown, very fusible and inflammable, and consists of bituminous oil, hydrogen gas, and charcoal."

It is evident that a substance which "melts and burns when heated, leaving no residue," and which is "very fusible and inflammable," would be totally unsuitable as a material from which to construct the body of a street pavement. Moreover, bitumen softens and flows at so low a temperature (from 100° to 120° Fahr.) as to be absolutely incapable of use for such purposes.

It follows, that Crochet and Perkins, when they used the word "Asphalt" in their respective patents, did not mean asphalt, but some other substance or substances to which they erroneously applied the scientific term "asphalt;" and therefore it remains for us to ascertain, if possible, what they meant by the word, and whether they both meant one and the same thing, or one meant one thing, and the other another and different thing.

On this subject, the evidence of the record is entirely clear and conclusive, as will be seen by reference to Malo's *"Note sur L'Asphalte"* (Tr. p. 127), his *"Note sur les Chaussées en Asphalte Comprimé"* (Tr. p. 171), Beckwith's Official *Report on the Paris Exhibition of 1867* (Tr. p. 183), Chabrier's article on *"The Applications of Asphalt"* (Tr. p. 209), the extract from *"Annales des Ponts et Chaussées"* (Tr. p. 231), the *"Minutes of Proceedings of the Institution of Civil Engineers,"* edited by James Forrest (Tr. p. 243), the extract from Malo's paper on *"L'Asphalte, Son Origine, Sa Preparation, Ses Applications"* (Tr. p. 253),* and the depositions and affidavits (admitted by stipulation) of *Barber* (Tr. p. 358), *Towle* (Tr. p. 361), *Richardson* (Tr. p. 363), *North* (Tr.

*In the Transcript translations of the French papers will be found arranged immediately following the respective originals.

p. 367), and *Ruthven* (Tr. p. 422), in which, among other important matters, the following facts will be found to be established, viz.:

In the early part of the 18th century mines of asphaltic limerock (now generally called in this country "rock asphalt") were discovered at Val-de-Travers, Neufchatel Canton, Switzerland (Tr. p. 209), and later at Seyssel, not far from the same locality, in France. Subsequently some of these mines were worked for the purpose of extracting the bitumen (asphalt) for distillation into illuminating oil and for other uses. (Tr. pp. 209, 211.) In handling this rock, the carts in which it was conveyed from the mines to the places of treatment would often let fall upon the road fragments of the rock, which would subsequently be ground up by carriage wheels passing over them, until finally the road became completely covered with the crushed stone, which gradually compacted together under the pressure of the wheels and became a smooth, solid and durable pavement. (Tr. pp. 164, 190.) Malo, writing in 1861, states that the remains of such a pavement, about sixty years old, were still in existence and in good condition at Seyssel, and that similar roads were to be seen in the neighborhood of all those mines. (Tr. p. 164.)

About the year 1832, Count Sassenay conceived and put into practice the idea of extensively manufacturing pavements of this material; but, from various causes (the principal one being, probably, the insufficiency of the road-foundation), the new pavement was not successful, and its use was, several years afterwards, abandoned.

About 1850, a Swiss engineer named Merian, observing the durability and excellence of the accidental pavements formed from the droppings of the carts, conceived the idea of manufacturing pavements of this material by reducing

it to powder, spreading it, heated, upon a *macadamized* road, and compressing it with a heavy roller. (Tr. p. 164.) This pavement proved entirely satisfactory, and other engineers took up the idea and introduced the Merian rock-asphalt pavement into Paris in 1854, where its success was so great that the manufacture of pavements from heated and compressed Seyssel and Neufchatel asphaltic limerock gradually extended all over Europe. (Tr. pp. 175, 213.)

From the very beginning of this new manufacture there was trouble and confusion as to the *name* of the material of which the new pavement was composed. The material was not *asphalt*—on the contrary, it contained from 90 to 94 per cent. of pure carbonate of lime, and only from 6 to 10 per cent. of asphalt or bitumen. (*Malo*, Tr. p. 156.) The term "compressed asphalt" (asphalte comprimé), however, began to be quite commonly used for it, until finally *Malo*, a distinguished French engineer to whose publications and exertions the general adoption of the new pavement was largely due, cut the Gordian knot, in 1861, by formally adopting the word "asphalt." In his paper of that date (Tr. p. 153) he says:

> "There is even no accord about the name which shall be given to it.
>
> "It is, then, just and necessary to fix the individuality of this body by an invariable expression which leaves it no longer to the hazards of locality nor to the caprices of language, and we propose to call definitively Asphalt *not oxygenated bitumen, as the chemists do*, but *limerock impregnated with bitumen.*"

The authority of Malo was sufficient to effect the adoption of the name recommended by him, and in the paving art of France, ever since. the bituminous limerock of Neufchatel and Seyssel has been known as "Asphalt,"

while, in other arts, "asphalt" has remained, as before, practically synonymous with "bitumen."

Thus Chabrier, writing on this subject, says (Tr. p. 209):

> "*Following the precedent of M. Malo,* the word 'asphalt' will be used to designate bituminous limestone, although scientific men regard asphalt as being synonymous with the matter impregnating the limestone, viz., bitumen."

Beckwith, in his Report upon the Paris Exposition of 1867, says (Tr. p. 189):

> "Very pure varieties, such as those of the Val-de-Travers in Switzerland and of Seyssel in France, contain absolutely nothing but carbonate of lime and bitumen."

Again (Tr. p. 188):

> "The chemical composition of asphalt (meaning the asphalt rock or 'rock asphalt' of France and Switzerland—Malo's 'asphalt') varies in the proportion of limestone and bitumen, being generally from 7 to 8 per cent. of bitumen, and 93 to 92 per cent. of limestone. The qualitative analysis gives nearly identical results everywhere."

And again (Tr. p. 189):

> "The remarkable properties of asphaltic rock permit of its being *used unalloyed* for streets."

It was of this Neufchatel and Seyssel limestone that Crochet was speaking when, following Malo's nomenclature and the then universal custom in France, he used the term "asphalt" in his French patent of 1880.

On the other hand, the word "asphalt," in the paving art of the United States, although it has been diverted from its original and proper meaning, has come, since 1870, to mean not Neufchatel or Seyssel rock (which, in this country, is generally called "Seyssel pavement") (C.

E. Foster, 310, Ans. 43), but an artificial composition consisting of sand, asphalt, petroleum-residuum, and pulverized limerock, mixed in the proportions of about 75 per cent. of sand, 12½ per cent. of asphalt, and 10 per cent. of limestone flour, with 2½ per cent. of petroleum residuum, and compounded and laid at a temperature of about 300° to 350° Fahr. (*Towle*, p. 362; *Barber*, p. 359; *Richardson*, p. 364; *North*, pp. 368, 369); *C. E. Foster*, p. 276; *Ruthven*, p. 423.) This was, self evidently, a composition very different from that of the Neufchatel and Seyssel limerock. The 75 per cent. of sand (unknown to the latter) was substituted for an equal percentage of limestone powder; the 12½ per cent. of asphalt was from 2½ to 6 per cent. greater than that of the Neufchatel and Seyssel rock; the petroleum residuum was entirely foreign to the Swiss and French material; and only 10 per cent. of limestone was used in place of from 90 to 94 per cent. contained in the foreign rock.

"Rock Asphalt."	American Mixture.
92 to 94 per cent. Limestone	10 per cent. Limestone
6 to 8 per cent. Bitumen	12½ per cent. Bitumen
	75 per cent. Sand
	2½ per cent. Petroleum residuum.

From these great differences of materials and proportions, it follows, unanswerably, that the problem of chemically repairing the French pavement was very different from that of chemically repairing the American pavement; and that a given repair process might succeed perfectly with the one and be a total failure with the other.

But the differences between the "rock asphalt" of Neufchatel and Seyssel and the artificial compound used in America are not confined to differences of materials and proportions—on the contrary, they strikingly manifest

themselves in the qualities and characteristics of the two paving substances.

(1.) *Rock-asphalt cannot be melted under any possible degree of heat alone.* (*Chabrier,* Tr. p. 224.) In order to melt it, a suitable *flux* must be used. Free pure bitumen, added to it, operates as such a flux. (*Id.,* same page.)* At the temperature of 140° to 160°, rock asphalt commences to disintegrate and crumble, and above 212° the disintegration is complete. (Beckwith, Tr. pp. 187, 188.) This characteristic of crumbling into a loose powder at from 140° to 212° Fahrenheit affords one of the industrial methods ("Hot Pulverization") employed to reduce the material to a powder for paving purposes. (Tr. p. 158.)

On the other hand, the American mixture does not crumble under the action of heat and become resolved into a loose powder. Its bituminous constituent simply becomes fluid, and the whole mass reduces to a paste, "the soft pliable state in which the surface material is originally laid, . . . a state in which all the particles are at a temperature of about 300 or 320 degrees Fahrenheit —in a semi-pasty, semi-granular, sticky and almost molten condition." (C. E. Foster, Tr. p. 279.)

(2.) Again: Overheating rock-asphalt "renders it as inert as sand," that is to say, absolutely destroys its cohesiveness and adhesiveness (Chabrier, Tr. p. 221); whereas, we know, from the practical use of the Perkins process, that even a flame driven directly against the surface of an American mixture pavement does not impair

* Bitumen below 50° is solid and brittle; from 50° to 70° it is elastic and begins to soften; from 70° to 90° it becomes soft and pasty; from 90° to 100° viscous; and at 110° or 120° (Malo, Tr. p. 173, says, 100°) "it melts." Two kinds of bitumen are known—the one form vegetable, the other from animal origin—and their composition is slightly different (See Tr. pp. 194, 154.)

the cohesive or adhesive properties of its component elements.

Now, two materials upon which the same degree of heat produces such very different effects, are, manifestly, not one and the same chemical substance. The chemical actions and reactions under heat are not the same in both, but widely different, and this fact demonstrates conclusively one of three things, viz., either (1) that their chemical elements are materially different, or (2) that the modes of chemical combination of their elements are different, or (3) that both elements and combination are different—*and that, whatever may be the difference, it is material,* because it gives the resulting compounds or mixtures very dissimilar properties. That there is a great difference in the ingredients of the two substances has already been shown; and we desire to point out that there is probably even a greater difference in the chemical combinations than in the ingredients themselves. The American composition is, apparently, a simple mixture, as distinguished from a chemical combination; although it is quite possible that the petroleum residuum or some of its elements may unite with the bitumen by combination. The European "rock asphalt," however, contains, undoubtedly, a true chemical combination of limestone and bitumen, formed naturally in the earth under great heat and pressure acting upon the materials for millions of years. We quote again from Malo (Tr. p. 155):

> "Thus we admit that at indeterminate epochs considerable masses of vegetable or animal remains buried beneath sedimentary beds and heated either directly by the central heat or by the invasion of volcanic currents have given birth, in an immense distillation, to all of the bitumens. It is certain that such gigantic action was exercised in a very various manner; that according to place, temperature, pressure, nature of adjacent rocks, epoch of operation,

species of primary materials, the product obtained has been given differences of form, aspect, composition and properties. But the mode of formation has been the same throughout and the resultant bodies include an identical principle, the *bituminous* principle, which does not resemble that of any other body whatever and about which it is not permitted to be mistaken."

The facts above stated, and those which will be hereinafter submitted, establish, we think, to a substantial certainty, the following theory of the constitution of rock-asphalt, viz., that it consists of fine granules of limestone chemically combined with bitumen or some of its elements, each of said combined grains being surrounded by a thin film (Malo, Tr. p. 156, calls it "an almost atomic coat") of uncombined bituminous material which, so long as it remains unsoftened, holds the combined granules together in a mass by virtue of the adhesive nature of the bituminous material surrounding them.

As already stated, on the authority of all the scientific and practical writers and experts, rock-asphalt, when subjected to a temperature somewhat above the melting point (120° Fahr.) of pure bitumen, commences to disintegrate, and at about 212° Fahr. crumbles into a mass of loose powder—a proceeding due, as all the authorities hold, to the softening of the "atomic coat of bitumen" surrounding each particle of limestone. Malo, (pp. 315, 316) says that if we now subject this crumbled powder to energetic compression, the rock-asphalt will thereby become "reconstituted exactly as it was in its primitive state, with the same consistence and the same aspect," and that "upon this singular property is founded the compressed asphalt street industry." We fail to see why he calls this property of reuniting under pressure a "singular property," for it would seem to be inevitable under the premises stated by him.

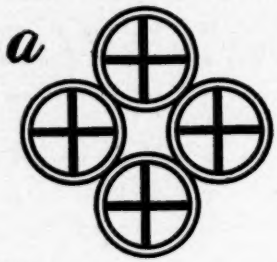
But if, now, instead of merely softening the thin films of bituminous material that surround the granules, we chemically *decompose* the rock and separate out all the bitumen contained in it, then it becomes impossible to reunite the limestone and bitumen so as to reconstitute the rock-asphalt, *nor can pure limestone and pure bitumen be artificially compounded into rock-asphalt.* Thus Chabrier says (Tr. p. 224) that rock-asphalt may be melted at a temperature between 390° and 480° if free bitumen be used as a flux, but that, after melting, it is no longer possible to reconstitute the material. *"Analysis gives bitumen and white limestone, but not bituminous limestone or asphalt."*

These two statements of Malo and Chabrier must be accepted as true. There is no evidence to the contrary of either, and they show on their face that their authors were not speaking theoretically, but of facts known to them by actual test. *These facts can be explained only on one theory,* namely, that the limestone granules contain *combined* bitumen and are surrounded and caused to adhere to each other by a thin film of uncombined bitumen or bituminous material—hence, when the uncombined bituminous material is softened by a gentle heat, the granules will fall apart, but if the resulting powder be again subjected to pressure rock-asphalt will be reconstituted; whereas, on the contrary, if the granules themselves be decomposed into limestone and bitumen they cannot be artificially recombined, and, therefore, if then compacted together, or even mixed with free bitumen and compacted, rock-asphalt will not result. Both Malo's and Chabrier's processes can be graphically illustrated, as, for example, by the following sketches, in which molecules (enormously magnified) of pure limestone are represented by small circles, molecules of combined limestone and bitumen by similar

circles containing a cross, the films of uncombined bituminous material by larger circles, and free bitumen by a rectangular block—rock-asphalt being indicated by *a*, combined limestone and bitumen by *b*, pure white limestone by *c*, and the separated bituminous film material by *d*, thus:

In Malo's experiment, we have, at the beginning,

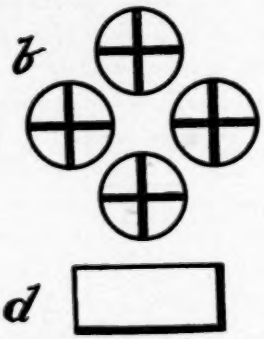
SKETCH 1.



a (rock-asphalt).

Melting out the uncombined bituminous films by a gentle heat, we get

SKETCH 2.



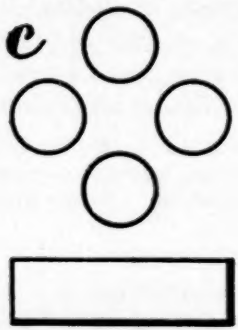
b (combined limestone and bituminous material), and *d* (free bituminous material).

Melting the free bituminous material, *d*, of sketch 2,

restoring it to the combined limestone and bitumen granules, *b*, and subjecting the whole to a compacting pressure, rock-asphalt is reconstituted as at *a* (Sketch 1).

In *Chabrier's* experiment, take rock-asphalt, *a*, (Sketch 1), melt out the uncombined bituminous films by a gentle heat, and the result will be, as in Malo's experiment, *b* and *d*. (Sketch 2.) Then adding the flux, and augmenting the heat to 435° (the mean between Chabrier's 390° and 480°), there results

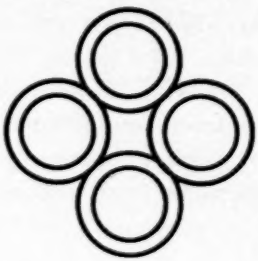
SKETCH 3.



c (pure white limestone), and *d d* (free bitumen and bituminous material).

Now, by remelting the bituminous element, *d*, and mixing it with the pure limestone, *c*, we obtain

SKETCH 4.



but not rock-asphalt, the absence of the crosses indicating that there is no chemical combination of the limestone and bitumen, but only a mere mixture. Perhaps by exposing this mixture for a million years to varying conditions of heat under the enormous pressure of an overlying mass of rock hermetically sealing it from the air, the re-combination of the pure limestone and a portion of the bitumen might again take place; but it does not take place under any conditions which we know how to supply artificially. The facts discovered and stated by Malo and Chabrier, therefore, seem to demonstrate conclusively that rock-asphalt consists of granules of combined limestone and bitumen, which granules are cemented together by thin surrounding films of bituminous material. M. E. Dayton (Tr. p. 396, near middle of page) says:

> "The difference in both cases is somewhat in kind like the difference between a mere mixture and a chemical combination. Nature produced in the rock-asphalt something that cannot be made artificially even from the same substances."

The fact that rock-asphalt can be crumbled by a low degree of heat, but cannot be melted by heat alone without the aid of a flux, strongly supports this conclusion. The necessity for using a flux ordinarily indicates the presence of a resisting and refractory chemical combination. In this connection, another statement of Chabrier is of especial interest. He says (Tr. p. 224) that if we take two pieces of asphaltic limestone, one containing 5 to 6 per cent. of bitumen, the other 15 per cent. of bitumen, the latter will not melt alone, but if we add 7 to 8 per cent. of pure bitumen *to the former,* it will melt, although having, even then, no greater percentage of bitumen than the 15 per cent. natural rock which, as he states, will not melt by heat alone. Here, the added fresh bitumen evidently acts

as a flux, and the existence of some peculiar chemical combination is strongly indicated. The facts that the added fresh bitumen acts as a flux, and the bituminous material melted from the films, though equal in amount, does not act as a flux, clearly negatives the idea of a mere mixture. There is evidently a chemical combination. With a mere mixture, there would not be the slightest difficulty in separating the elements by melting out the bitumen. For example, in bituminous sandstone of the silicious variety the sand (silica) is incapable of chemically combining with bitumen and they remain a mere mixture; but upon boiling the crushed sandstone in water, the bitumen floats and is skimmed off, while the silicious sand sinks to the bottom. This is the ordinary and easy industrial process by which bitumen is obtained from such sandstone for use in the arts. (Malo, Tr. p. 162.)

A mixture of bitumen with calcareous sand (powdered limestone) would separate just as readily and easily by the same process; but when those materials have lain together under a rock bed for millions of years, they will not separate by boiling nor by any degree of heat whatever. A great change has come over them; and that change can be explained only on the theory of some peculiar and recondite chemical combination.

This conclusion is further supported by the many unsuccessful attempts that have been made to *imitate* rock-asphalt by compounding limestone with bitumen or with some substance whose properties closely approximate those of bitumen. Chabrier (Tr. pp. 228, 229) gives the particulars of some of these abortive attempts, as follows:

IMITATION ASPHALT.

"By analysis asphalt mastic* gives limestone and bitumen. By mixing heated limestones and gas-tar,

* For explanation of this term see *post*, under the heading, "Mastic."

a material having some of the properties of asphalt mastic has been obtained, just as stucco has some of the properties of marble.

"The first trustworthy trials gave a bad result, and the employment of imitative asphalt was proscribed in all specifications of public works: But as detection is difficult, frauds soon take place on a large scale. As the great economy in imitation asphalt is in the saving of carriage, the proof of transport from the mines will prevent this in many cases. Imitation asphalt is applicable in certain rare cases, great care being taken in its preparation; but it should never be used for footpaths or in places exposed to great variations of temperature. *Bitumen, artificially combined with limestone, is unable to resist the tendency to disintegration inherent in those bodies, the components of which have been subjected to unknown conditions of temperature and pressure.*"

That the natural asphaltic limestone exhibits a remarkable tendency to resist disintegration, while the artificial asphaltic limestone does not, proves conclusively a difference in their chemical character. The case may be clearly stated thus: Between the natural and the artificial rock there is a decided difference of properties; that difference does not arise from difference of ingredients or proportions, for they are the same in both; therefore it must depend upon differences of chemical combination—in all probability upon the particles being combined in the one instance and only mixed in the other. This conclusion apparently has the force of a mathematical demonstration.

And we know of no reasons why limestone and bitumen should not chemically combine, under proper conditions of great and long-continued heat and pressure. Limestone consists of calcium, carbon and oxygen; bitumen, of hydrogen, carbon and oxygen. The constituents of bitumen are all capable of chemical combination with calcium, the base of lime, and are all found in various combinations with that

substance. What more likely than that, in rock-asphalt, a portion either of the bitumen *or of some of its constituent elements* has thus combined with the calcium carbonate, leaving the remainder free to form the surrounding films? If we suppose that a portion of one or more of its *elements* has thus combined, then the chemical character both of the calcium carbonate and the films would be changed; and this would explain why fresh bitumen does, and the old film bitumen thus deprived of a portion of its constituent elements, does not, act as a flux for rock-asphalt. Mr. Dayton (Tr., p. 395, folio 520) concurs in these conclusions. See, also, his answer to Q. 9, pp. 395, 396.

So far, we have been comparing the natural asphaltic limestone with its artificial imitation, and showing that there is in the former a chemical combination which does not exist in the latter. Now, turning to the American mixture, it is evident that it contains no such chemical combination. For the same reason that no part of the ninety-four per cent. of limestone used in the artificial imitation will combine with the bitumen, it follows that no part of the twelve and one-half per cent. used in the American mixture will artificially combine with the bitumen. Of course, the sand here used cannot combine, being composed of silica, one of the most refractory substances known. And if the petroleum residuum, or any of its elements, should combine with anything, it would be a combination entirely different from anything possible in the natural asphaltic rock, which does not contain petroleum residuum.

Finally, rock-asphalt pavements are not as good as those made from the American mixture. Under wear, they polish like marble, while the surface of the American mixture pavements remains granular and receives no polish, and is, therefore, safer for horses. The rock-asphalt pave-

ments break up more rapidly, and are difficult and more expensive to repair when disintegration begins. (C. E. Foster, Tr., pp. 318, 321.) It follows conclusively, that the Neufchatel and Seyssel asphaltic limestone is a very different substance from the American pavement mixture —different in its ingredients, in their chemical relations and in practical results. The two substances are, therefore, *different in law,* upon the principle clearly and authoritatively stated by the Supreme Court in *Meyer et al.* v. *Arthur* (*supra*), that "Any substance subjected to a chemical change by uniting with another substance loses its identity; it becomes a different mineral species." It is, therefore, of no consequence that the name "asphalt," which is applied to the one in France, is applied to the other in America; for the law cares nothing about names and everything about facts. In the present instance, the name is incorrectly applied in both cases; and we are, therefore, *a fortiori,* compelled to disregard it and to look solely to the characteristics of the two substances.

Mixtures such as those used in the United States have never at any time been used for pavements in France. (C. E. Foster, Tr., near bottom of p. 289.)

THE CROCHET AND PERKINS PROCESSES DIFFERENT PROCESSES

In law process inventions are divisible into three groups, as stated by Robinson (Rob. on Pats., Vol. 1, pp. 142, 144, 150, 249, 366, 398):

> "It is thus evident that the conception of means by an inventor includes two mental processes: A process of discovery, and a process of construction. The process of discovery consists in his finding out, by his own endeavors, of those qualities in the force, the object, or the mode of application, which render their union possible. The process of construction consists in combining the three factors into the idea conceived. (P. 142.) . . .

"From these considerations it appears that the creative faculties of the inventor may be exercised in the process of discovery on seven different occasions: (1) Where the capabilities of the force are discovered, the qualities of the other two elements being known; (2) where the susceptibilities of the object are discovered, the qualities of the other two elements being known; (3) where the availability of the mode of application is discovered, the qualities of the other two elements being known. (P. 144.)* . . .

"The concrete inventions falling within these fundamental groups do not necessarily belong to the same classes in the arts. Many processes, possibly some machines and manufactures, and probably all compositions of matter, are of the first group, representing the idea of a force applied. Processes which consist merely in the direction of known forces upon known objects, as well as most if not all machines and manufactures, are of the second group, embodying the idea of a mode of application. *Processes which consist in the subjection of specific objects to specific modes of treatment, based upon the discovery of new susceptibilities in the objects treated, constitute the third group.* The test, in any case of doubt, resides in the subject of discovery. Where the force alone has been discovered by the inventor, the other factors being known, the invention falls within the first group. Where only the mode of application has been discovered, the force and object being known, the invention belongs to the second group. *Where the object furnished the sole field of discovery, the invention is embraced within the third group.* The relegation of an invention to its proper group thus at once discloses its essential character, and renders its comparison with other inventions, for the purpose of determining their identity, accurate and practicable." (P. 150; the italics in all these quotations are our own.) . . .

* With respect to *process* inventions, Prof. Robinson, as we shall see in the remaining quotations from his work, changes the order of his groups, putting (2) as (3) and (3) as (2). Probably the relative order of these two groups as printed on p. 144 was an inadvertent error.

"In still other arts the object or susceptibility is the discovered factor, and the art consists in operating *with specific forces through specific modes of application* on this object or susceptibility." (P. 249, § 165.) . . .

"In the third class the sole endeavor of the inventor is to render useful to himself and to the public some object of whose properties he is the first discoverer, by so directing force upon it as to develop or employ its newly recognized susceptibilities; and his invention is complete when he has subjected this object to the action of some specific force in such a manner as to render its new properties available. The first invention is a force applied; the second is a mode of application; the third is the subjection of a *specific object* to a specific *application* of specific forces, producing *in the object* a certain specific result." (P. 366, § 262.) . . .

"And if it" (the invention) "be the application of specific forces in a specific manner to specific objects, *those qualities of the object which render it susceptible to this specific influence, as well as* those of the force and application, *become essential qualities of the invention, no one of which can be removed without destroying its identity.*" (Pp. 398, 399, § 285.)

Compare also *The National Filtering Oil Co.* v. *The Arctic Oil Co.*, 8 Blatch., 415.

This clear and philosophical analysis of process inventions, by the most learned and able writer who has yet treated of the subject, shows conclusively that the Perkins process belongs to the *third* group, the characteristic of which is, "The subjection of *a specific object* to a specific application of specific forces, producing *in the object a certain specific result.*"

The *object* acted upon by the Perkins process was, the American asphaltic-pavement mixture, consisting substantially of 75 per cent. of sand, 12½ per cent. of asphalt (natural bitumen), 10 per cent. of pulverized limestone,

and 2½ per cent. of petroleum residuum, compounded and originally laid at a temperature of *from 300° to 350°* Fahr. The *discovery* of Perkins was, a peculiar and previously unknown susceptibility of this particular compound, (evidently due to the chemical nature of the compound, because not existing in the Swiss and French asphaltic limestone), namely, that, in an old pavement, this material, when subjected to certain conditions, will unite with similar fresh material so perfectly that the old pavement and the new patch *weld* (or, as the workmen call it, *"bond"*) together—in other words, they will become one continuous, integral, and homogeneous mass without either the appearance or the presence of any dividing line, or "line of cleavage," between them,—thus rendering the repair of an old pavement expeditious, convenient, inexpensive, and effective, to a degree never before known. The *specific application of specific forces* which produces this result consists (after the dirty surface impregnated with foreign materials has been scraped off at the place which is to be patched), in subjecting the old pavement for a few moments to a vivid heat applied from above it, then stirring up the melted material at and around the spot to be repaired, and then applving the new material, in a heated condition, and compressing it into union with the old. In this "specific application of specific forces" another and very important *discovery* was made, to which the success of the process is unquestionably due, namely, that a fierce heat, when briefly applied to the exposed repair-spot, instantly forms a thin protecting scale over the surface acted upon, and this scale prevents the material beneath from burning, and causes it merely to soften and partially melt to the depth of half or three-quarters of an inch without having its tenacity or usefulness in any way impaired.

Volney W. Foster (Tr., p. 416) very clearly and intelligently describes this action as follows:

> "The phenomena of the application of heat to an old asphalt mixture pavement by the Perkins heater are: First, the instantaneous application of the intense heat of a flame on the surface of the pavement causes radiation and capillary attraction, bringing an excess of bitumen to the surface of the pavement, *which carbonizes and forms a thin crust of the surface material of a thickness of not more than one-quarter of an inch when the work is properly done.* This crust is formed almost instantly, or, at any rate, is the first result of the application of the blast of heat to the surface of the pavement. Thereafter, if the heat is not too long applied, the melting and not the burning rays of the heat are communicated to that part of the pavement material below the crust, *the crust on the one side and the concrete base on the other side making the sides of a comparative vacuum-chamber in which this material can be melted without volatilization.* We found it necessary to apply an intense heat, and to work rapidly and intelligently in the use of the heater. *In my judgment, the formation of this crust which produces what I have called a vacuum-chamber is the real secret of the success of the Perkins method of repair,* and explains the failure of the prior attempts, to which I have before referred, to reduce the old mixture to its original condition by the application of heat thereto, because in all such prior attempts the heat had been applied in open chambers or pans where volatilization was unrestrained."* (See, also, Charles E. Foster's testimony, Tr., pp. 280, 295, 308, 309.)

But the thin scale thus formed must be removed or broken up, to enable the new and old materials to coalesce

*In this last passage, Mr. Foster refers to his testimony in answers 9 and 10, where he described the previous waste of the old material cut out in making repairs, and the unsuccessful attempts to save and utilize it by remelting it in pans or cylinders. The heat volatilized the bitumen, which had to be subsequently restored. The cost of the attempt was found to be greater than the saving.

perfectly without any line of demarcation and possible fission; and this is accomplished by the subsequent stirring, which, at the same time, loosens up the plastic material beneath the scale and thus aids in effecting a homogeneous union or weld between the new and old materials. They practically fuse together into one continuous mass. The complete coincidence of the Perkins invention with the third group of process inventions described by Robinson is, therefore, perfectly clear.

The degree of *discovery* involved in Perkins' invention is well illustrated by the absolute incredulity with which engineers skilled both in the American and European art received the announcement of his process and its results. Not dreaming of this protective crust, they *simply would not believe the success of the process to be possible.* Lober says (Tr., pp. 342, 343, Ans. 17):

> "I remember very distinctly the opinion among practical men at the time the introduction of the Perkins method was proposed. It was considered to be totally impracticable and an absurd method of making a repair, one reason for which was that a sufficient heat to soften the pavement would destroy the virtue of the asphalt cement in the old mixture; also that it would be impossible to construct a heater that could be handled quickly enough for the purpose. I held these opinions myself and heard them expressed by others before I had seen the machine in operation or the process used. After seeing the process I said to Mr. Perkins that he had hit the biggest thing introduced in asphalt work for a long time."

Kasson testifies (Tr., p. 348):

> "It was the general opinion among asphalt experts that the process known as the Perkins method would prove to be an utter failure, owing to the general opinion that the life of the pavement would be utterly destroyed by the intense heat. That was my own opinion before seeing the process, and I also heard

the same opinion expressed by other expert asphalt men."

Burwinkle testifies (Tr., pp. 350, 351):

"Q. 10. Do you know what the general opinion was among those skilled in the art as to the operativeness of the Perkins mode of repair before the latter was demonstrated?

"A. The opinion was that by applying the heat direct to the pavement, it would burn the pavement, and it would become worthless."

Schwendeman testifies (Tr., p. 352):

"Q. 9. Do you know what was the general opinion as to the practicability of the Perkins method when it was first proposed?

"A. I did; it was that it would not be a success.

"Q. 10. Did you hear many persons express this opinion?

"A. I did. Nobody that I know of that was connected with the business at that time would believe in it, until it was demonstrated."

Volney W. Foster testifies (Tr., p. 355):

"When this method of repair was first brought to the notice of others skilled in this art, they uniformly pronounced it impracticable and useless, giving as a reason that it would burn and destroy, for practical use, the asphaltic ingredients of the composition of the entire upper layer of the part heated. We could not get permission from any contractor having a pavement under guarantee to consent to our demonstrating our method and its practicability. This was first done upon pavements laid by the Western Paving and Supply Company. Even after we had made repairs with this method, asphalt pavers with whom we sought to make contracts for the use of the Perkins method were not satisfied with the evidence of the repair in place, but had sections of such repair places cut out and removed for examination and experiment to prove that there was a bond and that the method had made a perfect weld of the old and new materials. The value of the Perkins method was not admitted until

> after we had demonstrated over and over again that the action of the heat and the oxygen of the air formed first a crust upon the pavement of about the thickness of a sheet of blotting-paper, and that the effect of the heat upon the portion of the pavement below the crust was to melt it, but not to burn it, in effect restoring it to its original condition before it was compressed. After these facts were proven, we had no difficulty in making royalty leases with the prominent asphalt pavers of the United States."

(See, also, Ans. 10 of his later deposition, Tr., pp. 416, 417.)

Richardson, a prominent pavement expert and chemist, testifies (Tr., pp. 365, 366) that when the Perkins method and apparatus for repairing asphalt mixture pavements was first submitted to him for approval, he—

> "did not believe it could be successfully applied to the purpose for which it was designed, but, on the contrary, his knowledge of the nature of the asphalt surfaces at that time in use in the United States led him to believe that the entire surface would be destroyed rather than that the upper portion could be burned and removed without injuring the lower part of the asphalt mixture."

Thus the discovery of Perkins was not, as Judge Woods incorrectly states it, the discovery of a "new application of heat," but was, on the contrary, to use the scientific language of Robinson, the discovery of a previously unknown "susceptibility" in the American mixture to the union, under certain conditions, of an old pavement with new repairing material similar to that of the pavement itself—*and this discovery rested upon the further and basic discovery* that, with the American mixture, the application of intense heat downward upon the spot to be repaired would result, not in burning and destroying the material, but in forming a thin protective scale or crust over it and thus preventing injury to the subjacent compound while yet allow-

ing it to soften and melt, so as to weld perfectly to the new material. None of the practical experts or scientific chemists knew this fact till they learned it from the Perkins process; and it was a discovery of prime importance, which revolutionized the art. *The above-cited testimony as to this whole matter is absolutely uncontradicted in the record.*

How or why the thin crust is formed does not appear. All we know about it is, that it is *not* formed on rock-asphalt, but *is* formed on the American mixture. It cannot be formed of the sand or the limestone; and therefore is probably formed as Volney W. Foster suggests (Tr., p. 416), by the heat causing radiation and capillary attraction to bring up from below bitumen or petroleum residuum, which, becoming instantly carbonized, creates a thin crust of carbon over the surface. In this action, it is probable that the petroleum-residuum plays an important part; for we must remember that rock-asphalt contains free bitumen, *but does not form a crust under the action of heat.* Bear in mind, however, that the free interstitial bitumen of rock-asphalt has had its qualities in some way altered; because it will not act as a flux, while free fresh bitumen will. It may be that this change of quality has something to do with preventing it from forming a crust.

Charles E. Foster says (Tr., p. 295, tenth line from top):

> "It is only from actual experiment that one learns the fact that upon the application of a blow-pipe blast as suggested in the patent in suit there *at once* forms upon the extreme upper surface a thin carbonaceous crust which practically protects all of the material below from overheating and reduces it to a pasty or molten condition for a considerable depth. This is the very opposite of the suggestion of the Crochet patent that the effect of heat is to disintegrate or decrepi-

tate the material for a depth of half an inch or more." (Italics our own.)

M. E. Dayton says (Tr., p. 397):

"It is a fact that a thin, continuous crust or scale is formed at the top of the pavement material where the flames impinge thereon. Beneath this scale the pavement mixture is melted, by which I mean that the 'asphalt cement' is melted and the sand heated so that the mixture, as far down as the melting heat may have been carried, is in a plastic or semi-fluid condition corresponding to the condition in which said mixture is originally laid. The scale formed at the immediate surface of the pavement appears to wholly prevent the burning or impoverishment of the cement beneath it, so that the latter is, in fact, *only* melted, and is apparently as rich, bright and efficient as ever.

. . . . . .

"There is nothing produced answering in any way to what may be called 'decrepitation' or 'powdering.' Even the thin scale formed upon the surface is not powdered, but is continuous. In some instances it is broken or formed into large pieces, and it may be very readily broken into fragments by strokes of a rake or by hand when cool."

Continuing, on p. 398, fourth line from the top, Mr. Dayton says:

"This scale serves to protect the mixture beneath it in a manner evidently calculated to prevent impoverishment thereof, and, on the other hand, to secure a mere melting of such subjacent material, even though the remelting be continued to a considerable depth by prolonged application of the flame to the scale.

"From one to three minutes is all the time necessary to continue the application of the flame blast heat of the Perkins method to accomplish deep enough melting of the pavement for the purpose of repair. Upon a pavement said to have been laid seven or eight years I have directed the continuation of flame heat of the Perkins method *for ten minutes and found no burning, but only a melting, of the asphalt mixture beneath the scale.*"

Henry N. Moss, superintendent of streets, Washington, D. C., testifies (Tr., p. 96, Ans. 230):

> "R-X Q. 230. As the result of the Perkins treatment does the raked off material show that it is coked or burned?
>
> "A. From my observation I should say it was not, unless through carelessness of the workmen, and not the fault of the system. I can recall no place where I have seen it either coked or burnt."

It is simply impossible that Crochet should have anticipated Perkins in the discovery of this "susceptibility," because the natural asphaltic limestone or "rock-asphalt" to which, in his patent, he referred under the name of "asphalt," *possessed no such susceptibility for anybody to discover.* When subjected to a heat far less than that of the Perkins process, the French and Swiss material, instead of forming a superficial scale or crust to protect the subjacent substance, crumbles into a mass of loose sand. Malo says (Tr., p. 157) that even the heat of summer causes it to decrepitate and tumble into powder; and, therefore, that it is not advisable to work the mines in summer. As Beckwith states in his report (Tr., pp. 187, 188), "at the temperature of 140° to 160° (Fahrenheit) it commences to disintegrate and crumble; above 212° the disintegration is complete." And again (Tr., p. 191): "If, on the other hand, any portion be overheated and burnt, the cementing substance will be expelled and leave a *dry powder destitute of the quality of cohesion.*" Chabrier (Tr., p. 221), writing of the French so-called "asphalt," says: "Over-heating asphalt renders it *as inert as sand.*" With Perkins' flame impinging directly upon it, under the blowpipe action of a forcing blast such as is generated in the Perkins machines, it would, of course, be "overheated," and would instantly be resolved into a loose dry sand, totally inert and incapable of cohesion.

The discovery made by Perkins was, *therefore*, not within the possibilities open to Crochet—indeed, he could not even *approximate* that discovery—because, long before he had reached the intense heat employed by Perkins, his material would have had the life burned out of it and would have become useless and worthless. It is possible that with a very gentle and well regulated temperature, slowly applied, so as not to rise above 160°, the disintegrating point, he could soften the thin coatings of bituminous material which surround the individual particles of chemically-united limestone and bitumen, to a sufficient extent to enable pressure to stick the new material to the old; but such process would have to be conducted with extreme care, and would be slow, expensive, and commerically impracticable. There would be no intermingling of the new and the old, and no "bond" between them. In practical work, it would be easier and cheaper to dig down through the asphaltic limestone to the rubble below and lay a new piece of pavement over the spot to be repaired—in other words, to "plug the hole," as it is technically called in the art. This was the repair process in general use prior to the Perkins invention. (Lober, p. 341, Ans. 4 to 7; Henry, p. 330, Ans. 4; Kasson, p. 347, Ans. 6, 7; Malo, p. 239.)

From the above facts it is easy to see that the information derivable from the attempted use of the Crochet process in France would tend to lead the mind not toward the discovery of the Perkins process, but away from it. No intelligent person, familiar with the action of heat upon the European asphaltic limestone, would ever dream that a quick high heat could be successfully applied to an artificial asphaltic composition suitable for paving purposes. The record is rich in interesting evidence sustaining this conclusion, and verifying our statement of the facts. Thus,

as to *facts*, Lober, the general superintendent of the Vulcanite Paving Company, of Philadelphia, with twelve years' experience in laying and repairing pavements composed of the American mixture and pavements composed of the natural asphaltic limestone, testifies as follows:

"Q. 32. (Tr., p. 345.) Has your company ever laid any rock asphalt pavements?

"A. They have.

"Q. 33. State the manner in which repairs have been made in that kind of pavement?

"A. The defective portion was cut out with an axe or cutter *down to the hydraulic concrete* and plugged with new powder, tamped and rolled.

"Q. 34. Did or did not this secure an absolute union or bond between the old and new parts?

"A. The plug would remain. I never cut one to examine the joint.

"Q. 35. State whether to your knowledge the Perkins process of repair was ever used in connection with rock-asphalt pavements?

"A. I have seen it attempted, but the experiment was a failure.

"Q. 36. State why it was a failure?

"A. The heat when applied to the surface of the rock pavement seems to dry up and powder the surface or heated portion. When this surface is removed the part below is hard and it is impossible to make a bond between it and new material which may be added.

"Q. 37. In the attempts to which you refer, was any effort made to open up the old material after removing the heated surface portion?

"A. Attempts of this kind were made by using a rake; but the only effect was to scratch the hard surface.

"Q. 38. State whether or not you ever took up or cut out a portion of *rock pavement* that had been repaired by the Perkins process, and if so, what kind of union was effected between the old and new material?

"A. I have cut out such a piece, found *absolutely*

no bond or union between the new and the old material. The hole was merely plugged up.

. . . . . .

"Q. 40. What is the effect of an apparatus like the Perkins heater upon a *rock-pavement?* Is or is not the latter melted or softened thereby?

"A. It is not softened, but powdered or crumbled.

"Q. 41. State whether it is possible to melt rock asphalt or to soften the same by heat?

"A. It is not. It will remain in its powdered condition even when subjected to a very high temperature. I have myself tried it as high as 325 degrees Fahrenheit."

"Q. 42. What would be the effect if you used a Perkins heater and applied the heat until the pavement was disintegrated to a depth of say three-quarters of an inch?

"A. It would absolutely destroy the three-quarters of an inch or an inch, and so harden and evaporate the bitumen in the remaining portion as to render it useless as a paving material."

As to the effect which a knowledge of the foreign asphaltic limestone would have in leading the mind away from the discovery of the Perkins process, he testifies as follows:

"Q. 43. If the process of operation, upon a pavement of asphalt mixture, specified in the preceding question, had been proposed to you at the date of the Perkins patent, say in 1893, would you or would you not have considered it a practical method?

"A. I would not. I would not try such a method even now."

Kasson (Tr., p. 349) testifies as follows:

"Q. 19. State if you ever made any experiments in the repair of rock asphalt pavements by the use of the Perkins process, and if so, with what result?

"A. I made an experiment in repairing a small amount of rock asphalt pavement in Kansas City, Mo. I found that the application of heat to the surface of the rock asphalt caused it to disintegrate or form a

powder, and after the part powdered was raked off, the material remaining underneath seemed to be so hard and smooth that it was impossible to make the new surface material adhere to it."

"Q. 20. When you raked off the disintegrated portion, did you scratch the surface beneath?

"A. It was so hard it would not scratch to any material extent.

"Q. 21. State how you applied the new material.

"A. The new material was applied in a heated condition and was thoroughly compressed by tamping, but we were unable to make the new material form a bond or weld with the old.

"Q. 22. Assuming that you had never heard of the Perkins method before trying the experiment with the rock asphalt pavement and that thereafter it had been suggested to you to attempt to repair an asphalt mixture pavement in the same way in which you had attempted the repair of the rock asphalt pavement, would you or would you not have then considered it practical to repair an asphalt mixture pavement by such process?

"A. Under those circumstances, I would not have considered it practicable. I would not even have attempted it."

Burwinkle (Tr., p. 350) testifies as follows:

"Q. 3. Have you ever had anything to do with the laying or repairing of asphalt pavements of any kind?

"A. I have been laying asphalt mixture pavements since 1886 and repairing the same. I have also repaired rock asphalt pavements.

"Q. 4. State the usual method of repairing rock asphalt pavements.

"A. By cutting down to the hydraulic concrete and then plugging the hole with new material.

"Q. 5. Are you familiar with what is known as the Perkins method of repairing asphalt mixture pavements in which the surface is heated, scraped up by a rake or hoe and then new material added and rolled down?

"A. I am.

"Q. 6. Have you ever endeavored to repair a rock asphalt pavement or pavements using the same means of repair and the same steps employed in the Perkins method of repair?

"A. I have.

"Q. 7. State whether or not in the making of repairs with rock asphalt pavements by the Perkins method you secured the same results as are secured in repairing asphalt mixture pavements by the Perkins method.

"A. I did not. In the Perkins method with asphalt mixture pavements, the new material is united to the old in a solid bond. In repairing the rock asphalt pavements the result is that the two do not unite.

"Q. 8. What is the effect of the heating of the surface of the rock asphalt pavement by means of a heater like the Perkins heater?

"A. You heat the surface until it becomes a crisp and when you rake this off there is a hard solid surface underneath.

"Q. 9. When you heat the surface of an asphalt mixture pavement by a heater like the Perkins heater, what is the effect?

"A. The part underneath the surface is soft and partly melted, so that it will pick up and stand when you work it with a rake."

. . . . . .

"Q. 12. Is it possible to melt or soften rock asphalt by the application of heat?

"A. That simply heats it, it doesn't melt. It remains in the form of a powder.

"Q. 13. Assuming that you had no knowledge of the Perkins process as applied to asphalt mixture pavements, but had the knowledge which you acquired from your efforts to repair rock asphalt pavements by first heating and then scraping away the disintegrated material, and then adding and rolling in new material, would you or would you not have known that this means of repair could be practically applied to repairing asphalt mixture pavements?

"A. I would not have known it. On the face of it, I would not have supposed it to be practicable when

applied to the asphalt mixture pavement. It would have discouraged my making such an effort."

Schwendeman (Tr., p. 351), a practical expert in paving matters, testifies as follows:

"Q. 2. How long have you had anything to do with the laying of pavements and what kind of pavements have you laid?

"A. I have laid most all kinds of pavements since 1882.

"Q. 3. Are you familiar with the modes of laying asphalt mixture pavements and rock asphalt pavements, and of the modes of repairing the same?

"A. I am.

"Q. 4. Have you ever made use of what is known as the Perkins mode or apparatus for repairing pavements?

"A. Yes, sir.

"Q. 5. Have you ever used or attempted to use the Perkins mode of repair and the Perkins apparatus for the purpose of repairing rock asphalt pavements?

"A. I have.

"Q. 6. Have you or have you not found the Perkins method to be successful in connection with rock-asphalt pavements?

"A. I have not.

"Q. 7. Why not?

"A. Because the new material only plugs the hole, but does not unite with the old material.

"Q. 8. Does a heater like the Perkins heater have the same effect in operating on a rock asphalt pavement that it has in operating on a pavement of asphalt mixture?

"A. It does not. On a rock asphalt, it burns and chars the pavement, so that when you scrape the charred part off, the bottom or underneath part is hard and dry, so that it is an impossibility to make a bond with the new material placed on top; where with other asphalts when the upper portion is removed, the pavement underneath is soft and very pliable; in fact, it seems to be the same as when it was originally

placed there before it was rolled; then by adding the new stuff on top of it, it makes a perfect bond."

. . . . . .

"Q. 11. If before knowing of the Perkins process, you had had knowledge that a rock asphalt pavement could be burnt out, forming a hole or depression, which could be plugged up with new material, would or would not this knowledge have shown you that an asphalt mixture pavement could be repaired by means of a heater so as to secure a union of the old and new material; in other words, would or would you not have known from the results with rock asphalt that it would be practicable to use such a method as the Perkins method for repairing asphalt mixture pavements?

"A. I do not think I would. I would have had to try experiments to find out whether or not the heat would destroy the pavement down to the concrete."

Charles E. Foster, a scientific and practical expert, familiar both theoretically and practically with rock-asphalt pavements and American mixture pavements, testifies (Tr., p. 290) that with the utmost effort, and giving attention to every detail specified in the Crochet patent, he could not get the old and the new materials (rock-asphalt) to weld together, but found that they would unite only by "a frictional adhesion so that the new part readily separated from the old upon receiving a slight blow." He had also at different times endeavored to weld together a compressed block of rock-asphalt and a body of fresh material, sometimes cold and sometimes heated, by *compacting* the fresh material upon the already molded block; but he could never secure anything more than a mechanical adhesion which would permit the parts to separate under a very slight strain. The Crochet patent itself (just below middle of p. 122), where it states that the striæ formed by the rake *"augment the adherence" of the patch to the old pavement*, confirms the correctness of Mr. Foster's position. They could have no such effect where the parts melt or weld together, but only where one sticks to the other

with an imperfect adhesion. It is not necessary to heat the rock-asphalt powder in laying a pavement; it compacts just as well, and perhaps better, when laid cold. (C. E. Foster, Tr., pp. 289, 290.)

Thus we see clearly that before Perkins made his discovery of a peculiar property or "susceptibility" of the American mixture, namely, that when its surface is subjected suddenly to a lively heat the exposed material automatically covers itself with a thin protecting shield and merely melts and softens beneath that shield, it was not possible for an intelligent person, familiar with European rock-asphalt and the effect of heat upon it, to dream of obtaining any improved or even practicable result by suddenly applying any considerable degree of heat directly to the surface of an American mixture pavement. He could only expect that the bitumen and petroleum-residuum would be instantly burnt out by such a process, leaving merely the sand and limestone powder, which would not unite with the new repairing material. The general incredulity of the practical experts after Perkins had invented his process, as depicted in Volney W. Foster's testimony (Tr., pp. 355, 417), puts this matter in a strong light.

The legal conclusion must be, we confidently submit, that Perkins made a discovery, and invented a practical process for utilizing it in the pavement art, where it has proved of great value to the public. Volney W. Foster puts its annual saving at "more than a million dollars a year in the cost of repairs on present yardage of asphalt pavements in the United States" (Tr., p. 412). Kasson (Tr., pp. 348, 349, Ans. 18), puts the saving at 50 cents per square yard; Cranford (Tr., pp. 82, 83, Ans. 138), at 33 1-3 per cent. of cost per square yard. V. W. Foster testifies (Tr., p. 339, Ans. 5) that the plaintiff has been receiving about $20,000.00 a year for the use of the process.

ONE OF MALO'S STATEMENTS EXPLAINED.

One statement of Malo, found in his 1888 book, should be explained, in order that the court may not be misled by it, namely, his statement (Tr., p. 241) that pavements of rock-asphalt may be repaired from superficial injuries by placing a few centimeters above the damaged spot a heated iron plate 10 or 12 millimeters (about one-half inch) in thickness, then removing the plate, lightly raking the heated surface, or, as he says in another place, scraping and removing it to the necessary depth, covering the spot with powdered rock-asphalt, and finally tamping down the new material to the level of the street—a process which, he says, results in uniting the new material to the old, and had been in successful use several years.

The process undoubtedly results in temporarily sticking the new material to the old, but not in *welding* them together. The two materials would not become homogeneous and without a visible joint, but would simply resemble one plate weakly stuck to another. This is what C. E. Foster (Tr., p. 291) found to be the fact, by careful experiment. Even the Perkins machine, with its far more active heat, is unable to form a "bond" or weld between new and old *rock-asphalt*, as we have already shown from the practical experience of Lober, Kasson, Burwinkle and Schwendeman. It must be remembered that under the influence of sharp heat rock-asphalt becomes "as inert as sand" but never melts; and that under a heat of 140° to 212° or more, it crumbles into a loose powder. What actually takes place, therefore, in Malo's repair process, is as follows: The hot thin plate will remain red-hot only a minute or two, and the sensible effect of its heat upon the pavement an inch or more ("a few centimeters") below the plate will be barely sufficient to reduce the surface to a

powder. There can be no melting, for rock-asphalt never melts under the action of heat alone. When, therefore, the loose powder is scraped out there will remain under it a hard bed with which the new material will not blend indissolubly (C. E. Foster, p. 290, folio 369), but to which it can stick when tamped down, just as chewing-gum will stick to a smooth wooden board. If before introducing the new material the hard bed be "lightly raked," it may become faintly scratched, and the scratching may slightly facilitate the sticking of the new material to the old hard surface; but there will be no amalgamation of the old and new materials into one continuously homogeneous and integral mass. A joint or line of cleavage will always remain betwen the old and new materials, just as described by C. E. Foster, on pp. 290, 291, and by all the other practical experts, and this joint will weaken the structure and render its two portions liable, under a comparatively slight disturbance, to separate from each other along the line of cleavage.

ASPHALT MASTIC.

We have postponed consideration of this compound for three reasons: (1), because it is a substance widely different both from rock-asphalt and from the American mixture; (2), because it is adapted only to the manufacture of sidewalks; and, (3), because Crochet's process was designed for the repair of compressed rock asphalt pavements (Asphalte Comprimé).

Beckwith (Tr., p. 187) defines asphalt mastic as "a composition formed of bituminous limestone reduced to powder and mixed with a small quantity of bitumen. This mastic, with a further addition of bitumen and fine gravel, is used for sidewalks." The mode of its preparation is

described at length by Malo (Tr., pp. 160, 161), and by Beckwith (Tr., pp. 194 to 196). It has all the qualities of a cement for uniting building materials, says Chabrier (Tr., p. 223), and, on p. 277, he enumerates many of its possible uses, such as for medicinal preparations, making cisterns, jointing together paving-stones, flags and walks, coating of terraces, etc., etc. All the authorities cited by the defense, speak of it as used at the present time mainly, if not only, in a composition for sidewalks. (See Malo, Tr., pp. 161, 164; Beckwith, pp. 187, 196, 197; Forrest, p. 223.) C. E. Foster says (Tr., p. 322) of these compositions: "They certainly were never employed for paving roadways." It is composed of powdered limestone 82 per cent., and bitumen 18 per cent., and is cast into blocks and transported and sold in that form. When a sidewalk is to be laid, the engineer melts the mastic and carefully mixes it with additional bitumen and with gravel or sand in the following proportions:

Mastic ....100 pounds.
Additional bitumen .....5 to 6 pounds.
Fine gravel or sand.....60 to 70 pounds.
(Beckwith, Tr., p. 195.)

The resulting sidewalk composition is, therefore, composed substantially of

Powdered limestone .....50 per cent.
Bitumen ....14 per cent.
Gravel or sand.....36 per cent.

While still hot, and of the consistency of mortar it is carried in hot iron ladles to the place where the sidewalk is under construction, and is there dumped between temporary curbs or rules, and spread out and leveled with a trowel, like mortar, to the depth of 3/5 of an inch, and then lightly showered with fine sand. In a few minutes the sidewalk is ready for use (Beckwith, Tr., p. 197). This

substance differs from rock-asphalt in containing 6 to 8 per cent. of free bitumen (in addition to the combined bitumen carried by the limestone), in containing 36 per cent. of gravel or sand, and in lacking from 42 to 44 per cent. of the limestone found in rock-asphalt. It differs from the American mixture in carrying about 2 per cent. more of free bitumen, 40 per cent. more of limestone, 39 per cent. less of sand, and no petroleum-residuum. It is, therefore, so widely different in composition and character, both from rock-asphalt, on the one hand, and from the American mixture on the other hand, as to be hardly capable of comparison with them. What effect the Perkins process would have upon it no man knows. In sidewalks, it is laid only 3/5 of an inch deep, and therefore is not adapted for surface repairing. When such a sidewalk gets out of order, the old material at the damaged spot must necessarily be removed bodily and a patch of new material substituted. (See C. E. Foster, Ans. 50, p. 312.)

Like rock-asphalt, this is not the material which constitutes one essential element of the Perkins process, or, as Robinson states it (*supra*), whose qualities "*become essential qualities of the invention, no one of which can be removed without destroying its identity.*"

For a full and thorough discussion of the subject of mastic, see Mr. Dayton's deposition, Tr., pp. 372 to top of 383.

PROCESS INVENTIONS.

In the law of process inventions, the essential thing necessary to ~~constitute~~ constitute a patentable process is, that it shall "involve chemical or other similar elemental action," "though mechanism may be necessary in the application or carrying out of such process" (*Risdon Works* v. *Medart*, 158 U. S., 86, 72). In the domain of chemical and ele-

mental action, nature has shut out from our view the molecular action of the elements which causes them to combine or refuse to combine under given conditions, and has left us to judge of such action only by its results. Where a difference of result appears, we can predicate a difference of action; but how or why such difference of result is effected, we are utterly unable to know. We do know, however, that slight differences in the materials or the conditions sometimes produce astonishing effects. A molecule of oxygen and a molecule of hydrogen will repose peacefully side by side, but touch them with fire and they instantly become water. Molecules of nitrogen and oxygen, simply mingled, form atmospheric air, but if two molecules of nitrogen be chemically combined with three of oxygen, they form nitrous oxide, a poisonous gas, and with five of oxygen they form nitric acid, a vastly more corrosive and poisonous liquid. The result is plain to be seen; but the action which produced it is totally unknown and apparently unknowable. Influenced by such facts as these, and desirous of honestly performing their constitutional duty to "promote the progress of the useful arts," the courts handle process inventions with great delicacy. If they are satisfied that any material difference of result is produced, they wisely infer a difference of action among the elements, and if the difference of result be new and useful, they assign to the person who first caused its production the character of a discoverer, and hold his patent valid. Thus in the Nickel-Plating cases (*The United Nickel Co.* v. *Harris,* 15 Blatch., 319; *Same* v. *Brass Co.,* 16 Blatch., 68; *Same* v. *Anthes,* 1 Holmes, 155; *Same* v. *Keith,* 1 Holmes, 328), nickel-plating had been performed, but not satisfactorily, with double chloride of nickel and ammonium. Dr. Adams discovered that impure commercial chloride had caused the trouble, obviated it by merely

using chemically pure chloride, and his patent was readily and strongly sustained. So, in *Lawther* v. *Hamilton,* 124 U. S., 1, this court found that an old process, long in use, for extracting oil from seeds, had been improved by omitting the action of one of the mechanical elements, the muller stones; and it sustained a patent for this improvement. In *The National Filtering Oil Co.* v. *The Arctic Oil Co.,* 8 Blatch., 416, although bone black had been before successfully used for rendering filthy water inodorous, for depriving rancid oils of their disagreeable smell and taste, and for decolorizing olive oil, sugar, and other chemical substances, yet a patent for its use in purifying petroleum was broadly sustained by Judge BLATCHFORD, with the apparent aproval of Mr. Justice NELSON.

In *Neilson* v. *Harford,* 1 Web. P. C., 275, the process consisted in using hot instead of cold air in smelting iron ore. In *Tilghman* v. *Proctor,* 102 U. S., 707, 728, this court said:

> "*The mixing of certain substances together, or the heating of a substance to a certain temperature,* is a process. If the mode of doing it, or the apparatus in or by which it may be done, is sufficiently obvious to suggest itself to a person skilled in the particular art, it is enough, in the patent, to point out the process to be performed, without giving supererogatory directions as to the apparatus or method to be employed. If the mode of applying the process is not obvious, then a description of a particular mode by which it may be applied is sufficient. There is, then, a description of the process and of one practical mode in which it may be applied. Perhaps the process is susceptible of being applied in many modes and by the use of many forms of apparatus. The inventor is not bound to describe them all in order to secure to himself the exclusive right to the process, if he is really its inventor or discoverer. But he must describe some particular mode, or some apparatus, by which the process can be applied with at least some benefi-

cial result, in order to show that it is capable of being exhibited and performed in actual experience."

The legal meaning of these several decisions seems to be as follows:

1. In the Nickel-Plate case, that any slight change in the condition of one of the chemical elements of a process is patentable if it produces a useful result.

2. In the Oil-Seed case, that a process of moistening and pressing *crushed* seeds is legally different from a process of moistening and pressing *crushed and ground* seeds; in other words, that a change in the condition of the thing *acted upon* constitutes a new process.

3. In the Arctic Oil case, that the filtering of water, syrup, or olive oil, through bone black, is not the same process as the filtering of petroleum through bone black; in other words, that to substitute another thing for the thing acted upon changes the process.

These cases, therefore, not only show how slight a change will sometimes differentiate one process from another, but they fully bear out Robinson's statement that in processes, the qualities of the thing acted upon "become essential qualities of the invention, no one of which can be removed without destroying its identity."

In *U. S. Repair & Guaranty Co.* (this petitioner) v. *Standard Paving Co.*, 37 C. C. A., 28; 95 Fed., 137, a case on the Perkins process patent here in suit, Judges WALLACE, LACOMBE and SHIPMAN sustained the validity of this patent on the very ground stated by Robinson, viz., the difference between the materials acted upon. (See 95 Fed., 139.) That court, although it mentioned the crust or "skin," seems not to have observed the important and decisive fact that Perkins, by the production of such crust or skin, *discovered a previously unknown quality* of the American mixture, namely, that of automatically pro-

tecting itself against the destructive effect of sharp heat, by covering itself with such thin refractory superficial scale, beneath which the material will soften and melt, but not burn—a fact which, as we have shown, was entirely unknown to pavers and chemists. Even though uninformed of such fact, the New York Court of Appeals deemed the diversity of substances acted upon a sufficient reason in law for sustaining the patent—how much stronger, then, becomes the ground for sustaining it, when we find that the great practical success of the Perkins process depends upon a peculiar quality in the American mixture, discovered and utilized by him, and which does not exist in the rock-asphalt used by Crochet.

The Circuit Court of Appeals of the Seventh Circuit not only disregarded the difference between the materials acted upon by the Perkins and Crochet processes, respectively, but referring to the formation of the thin crust, declined to consider it a part of the Perkins process, or to allow it any effect whatever in determining what the invention is, or how the patent should be interpreted. Their language (Tr., bottom of p. 542 and top of p. 543) is:

> "At most it is an incidental, perhaps invariable, result of the practice of the process in the one way and by means of the one form of apparatus described. The testimony is that only by experiment was that result discovered or discoverable, and it does not appear when the discovery was in fact made. Probably not before the patent was issued, else it would, if possible, have been made the subject or incident of a special claim. But it is unnecessary to go further into details."

We respectfully submit that this is a very narrow and illogical position. Assume, if you please, that the formation of the crust is a "result" of the practice of the process by the means described in the patent; still it is admittedly

a new result, and therefore demonstrates the existence of *a new process*. As we have shown, processes are distinguishable mainly by their results. Again, if the result was discovered or discoverable "only by experiment," then *the efficiency and utility of the process* were discovered or discoverable only by experiment—a fact which strongly supports the novelty and patentability of the invention. Finally, the assumption that the result was not discovered till after the patent was issued, is mere guesswork, without any reasonable consideration to support it. Volney W. Foster testifies (Tr., pp. 354, 355) that the inventor, Perkins, was a practical paver, "an employé and officer of the Western Paving and Supply Company," and that he made the invention as the result of "a series of experiments," undertaken at the urgent request of Mr. Foster. Mr. Foster again testifies (Tr., top of p. 416):

> "I instructed Mr. Perkins to follow up his ideas, and he instituted a series of experiments in the application of heat directly upon the pavement in the place to be repaired, and after the first few trials we were both satisfied that he had discovered the right way of repairing these pavements, and I insisted that we should obtain patents upon the invention at once."

This is absolutely inconsistent with the assumption of Judge Woods that neither Mr. Foster, the president of the company, nor Mr. Perkins, its vice-president and general manager (see top of p. 414), knew what they were doing when they took out this patent. Judge Woods bases his conjecture upon the mere fact that the patentee did not make the crust "the subject or incident of a special claim," but the fairer supposition is that the patent solicitor who wrote the specification believed that, in covering the *process*, he was fully protecting his client. When he wrote in lines 86, 87 of p. 1 of the specification (Tr., p. 489), that "the particles deep down" are "*melted and yet not burned*,"

it can hardly be conceived that he was ignorant of the temporary crust which aids in producing this remarkable result.

OTHER ERRORS OF THE SEVENTH CIRCUIT COURT OF APPEALS.

Similar narrow and unfriendly reasoning appears in other parts of the opinion under consideration.

1. The specification of the patent is clear that the degree of heat to be applied in the described process is necessarily a high or vivid one, giving quick results. Thus, in lines 39-46, column 1, page 1, it says: "In practicing my invention, however, I subject the spot to be repaired and the surrounding edges *to such a degree of heat that the surface asphalt, not only the exact spot to be repaired, but the surrounding portions to a greater or less degree, is reduced to the soft pliable state in which it is originally laid.*" In line 68, column 2, page 1, it states that the burners project *a flame downward against the pavement;* in lines 70, 71 that *a blast* is employed; in lines 77-79 that "a *strong blast of heat* is projected against the *surface* of the asphalt and *readily melts* it;" in lines 82-87 that the burners "*soon reduce* the surface asphalt, both at the spot and at the surrounding edges to a pliable state, the *strong* blast causing not only the immediate surface but the particles *deep down* to be melted and yet not burned."

The process described in the specification is, therefore, distinctively characterized by the application of a quick, violent heat downward against the surface of the spot to be repaired and its surrounding edges, after which the new material must be added, tamped and smoothed. The claims must be read and construed in the light of this fact. Yet the Court of Appeals of the Seventh Circuit, finding only the word "heat" used in the claim and reading in the

specification, p. 1, lines 50, *et seq.*, that "the heating of the surface may be accomplished in various ways and by means of various forms of apparatus," overrides the plain requirement of vivid heat described in the specification as a material element of the Perkins process, and holds, in effect, that the claim covers any degree of heat, great or small, vivid or not vivid. The plain answer to its contention is, that the words last above quoted do not mean that a non-vivid heat may be substituted, but that the necessary vivid heat may be produced in various ways and by various forms of apparatus—a proposition which seems too clear for argument. The specification-writer evidently suspected that other ways of producing and applying the required vivid heat might be discovered or invented, and he was properly endeavoring to protect the rights of his client in such event. To construe this prudent precaution into a waiver of the vivid heat element, which is treated throughout the specification as the most essential element of the process sought to be patented, is, certainly, very extraordinary! If the two parts of the specification in question were hopelessly inconsistent with each other, the patent might be void for ambiguity; but they are not. The one means that vivid heat must be used, and shows one way of producing and applying it; the other means that there may be other ways and means for producing and applying such heat, and therefore the patentee does not desire to limit himself to the particular ones described. The two parts are therefore perfectly harmonious, and they should be construed together to protect the invention, not to destroy it.

2. Having thus expanded claim 1 to cover all degrees of heat, great or small, the court then proceeds (Tr., p. 541, middle paragraph) to hold that the patentee is estopped to limit that claim, by construction, to vivid heat,

because, at the suggestion of the Examiner while the application was pending in the Patent Office he cancelled the original claim 3, which expressly mentioned "a strong blast of heat," and thereby "voluntarily abandoned the claim for a method limited to the use of a 'blast of heat.'"

We submit that the court was altogether too critical. The Examiner held that claim 1 and claim 3 were, in substance, identical, and therefore he required the applicant to strike out one of them, in order that the patent should not issue with two claims for one and the same thing. The inventor acquiesced in this ruling, and cancelled claim 3. It is perfectly evident that he did not intend to abandon anything except the right to secure duplicate claims. As we have already remarked, both claims referred to the one process described in the specification, and that process required the application of an intense heat to the surface of the pavement. Both claims should, therefore, be construed as involving the application of intense heat. But while both were obviously limited by the description of the process to intense heat, claim 1 was in terms broad enough to cover the application of such intense heat in any effective way and by any effective form of apparatus, while claim 3 was expressly limited to applying the heat in "a strong *blast*," and by means adapted to create a blast. In cancelling claim 3, therefore, the applicant simply eliminated a specific and narrow claim to the use of a strong blast, but did not alter claim 1 so as to make it cover anything less than the intense heat described in the specification. And this, we submit, is the true construction of the patent. Your Honors will remember that the evidence shows an intense heat to be practically necessary to the working of the Perkins process (see Volney W. Foster, p. 416, folio 553); but it does not show that a *blast* is the only way in which such heat can be applied, nor that a

"strong" blast is the only form of blast that will answer the purpose. (See Dayton, top of page 56, and Ans. 11, pp. 398, 399.)

The result of these considerations is, that claim 1, when properly construed with reference to the specification covered, and still covers, the application of intense heat, however produced, and was not in any way affected by the removal of claim 3. The ruling of the Court of Appeals for the Seventh Circuit involves a departure from the ordinary principles of patent construction, fatally changes the character of the Perkins process, and renders the patent worthless.

3. But the Court of Appeals was, apparently, afraid that the patent might escape *somehow*, and so they proceed to hold (Tr., p. 543, last paragraph of opinion) that even if claim 1 be construed as meaning the use of a blast or strong blast of heat, then it becomes a patent for a *mere aggregation of steps*, and is, therefore, invalid in any view of the case. To sustain this contention, they take the ground that the addition of the new repairing material, and the final act of smoothing and burnishing, are "separate and independent" acts, not constituting steps in the real invention. On this sort of reasoning, any patent for a process may be readily overthrown.

The conclusive answer to it is, that the patent is for a "Method of Repairing Asphalt Pavements," and that all the steps named in the claim are necessary to the operation, and are, therefore, proper elements of the claim, as pointed out by Mr. Dayton. (Tr., p. 61, Ans. 72.) "A process is a mode of treatment of certain materials to produce a given result. It is an act, or series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing." (*Cochrane* v. *Deener*, 94 U. S., 788.) Without the addition of the new material after

the intense heat has melted the upper portion of the spot to be repaired, the heat would be useless, and the operation a silly farce.

4. Having eliminated the blast from the claims, and enlarged the scope of claim 1 to cover any degree of heat, great or small, the Court of Appeals then proceeds to hold (Tr., p. 542) that the invention consisted, not of a method of repairing asphalt pavements, but "A method of *applying heat,*" namely, by a blast or blow-pipe action, and, therefore, (top of p. 543) that that method is not covered by the patent. We think that the patent itself is a sufficient answer to that argument.

We call attention, in this connection, however, to the admission of the court (Tr., p. 542) that such blast or blow-pipe action would be separately patentable as a process by itself. We fail to see how; blow-pipe action is probably as old as Vulcan or Tubal-Cain, and, taken by itself, is the same process, whether applied to iron or asphalt. In our judgment, no court in the country would have been more ready than the Court of Appeals for the Seventh Circuit, to hold the patent void for anticipation if it had claimed any such well-known invention as that. The blow-pipe action may well be a *step* in a valid process patent, but it certainly is not a new process by itself.

5. To support this theory of the blow-pipe action being a patentable process by itself, the court claims to rely upon the opinion of our expert, Mr. Dayton; but Mr. Dayton would be amazed to find himself cited as holding such an opinion. What he really did say on the subject will be found on pp. 390, 391, of the Transcript, where he stated that the Perkins method is "characterized," and "distinguished," by such way of applying heat, as well as by the difference between the materials used by Crochet and Perkins. There is not a word in his testimony to the effect

that he would regard the Perkins process as patentable if for a mere method of *applying heat, or if divorced from* the American mixture material or the step of filling the hole with new material and tamping and smoothing it. He was simply speaking of the Perkins process as an entirety, and calling attention to the fact that it was, among other things, characterized by at least one novel step *in pavement repairing,* to wit, the application of intense heat to melt the old material and enable the old and the new to fuse together. That he considered the patented process as consisting of the entire series of steps mentioned in the claim is conclusively shown by his answer to Q. 72, Tr. p. 61.

On one point, we agree with the Circuit Court of Appeals, to wit, where (p. 542, below the middle) they find that "The apparatus of Crochet was defective and objectionable for reasons that are . . . obvious."

INFRINGEMENT.

On this subject, little need be said. The evidence (see Stipulation, Tr., pp. 21, 22) fully establishes the fact that the defendant uses the same steps in the same relative way, as set forth in the claim of the Perkins patent here in suit. The defendant examined but one witness, Smith, whose depositions will be found on pp. 103 and 118. Smith testified that the material used by the defendant in laying and repairing pavements, is "Utah Lime Rock Asphalt, mixed with maltha and sand in right proportions" (p. 111, Ans. 67), that the "Utah Lime Rock Asphalt" is "used in its crude state" (Ans. 68) and that the heat employed in mixing the materials is from 260° to 300° (Ans. 70.)

"Maltha" is used in the pavement art as the equiva-

lent of "petroleum residuum." (See testimony of *North*, Tr., top of p. 369.) Petroleum residuum "is a product of crude petroleum after certain of the lighter oils have been distilled off." (*Kasson*, Ans. 75, p. 106.) It is a liquid or semi-liquid. (C. E. Foster, Ans. 27, p. 306.) It is, therefore, heavier than crude petroleum, but not so heavy as asphalt or bitumen, occupying a place substantially midway between those two substances. Maltha is defined by the Century Encyclopœdia and Dictionary as follows: "A bituminous substance midway in consistency between asphaltum and petroleum. From its tarry appearance it is sometimes called mineral tar." In other words, maltha and petroleum residuum are substantially one and the same thing, both being derived from petroleum by distilling off the lighter oils, and differing from each other only in the fact that the distillation in the one case has been effected by processes of Nature, and in the other by processes of Art.

No witness testifies definitely as to the precise composition of the substance which Smith calls "Utah Limerock Asphalt." Its name implies that it contains calcium carbonate and bitumen, and that it comes from Utah. There is nothing in this to indicate that its two ingredients are chemically combined together; and its behavior under intense heat shows that they are not so combined but are simply mechanically mixed, forming a calcareous sandstone mingled with bituminous matters. For pavement purposes, it is *not* the equivalent of the Val de Travers and Seyssel rocks, and *is* the equivalent of the powdered limestone and bitumen used in the American mixture pavements; because it does not disintegrate and crumble under the action of heat, but melts into a liquid or pasty condition, and because alone it is not fit for making pavements, but must be mixed with sand and maltha or pe-

troleum residuum. In the patent law, chemical substances, for any certain purpose, are equivalents when they are *"equally good."* (*Tyler* v. *Boston,* 7 Wall., 327, 330.) Now, for making pavements, when used alone, or without the admixture of other ingredients, the Utah and foreign rocks are not "equally good," for the latter is capable of such use, while the former is not; nor are they "equally good" when used in composition with sand and maltha or petroleum residuum, for the former is capable of such use, while the latter is not. They are, therefore, not equivalents for pavement purposes; but the Utah rock is plainly equivalent to the limestone-flour and bitumen of the American mixture, for both are "equally good" for such purpose.

The whole subject is thoroughly discussed by C. E. Foster (Tr., middle of p. 284 to middle of p. 287), and M. E. Dayton (Ans. 8, pp. 38-40). Among other things Mr. Foster (p. 284, near the bottom) testifies that the defendant's mixture is a "material which would become soft, pliable and molten by the application of heat whereby it is practicable to agitate and open up the surface of the old material so that the new may be added to and weld with the old, forming an integral structure without any line of demarcation;" and again (near middle of p. 285), he says: "7. The two modes" (meaning the Perkins mode and the defendant's mode) "are alike in that they result in uniting the two parts or sections without any dividing line, because the new material is mixed with and becomes a part of the old pavement."

Mr. Dayton (p. 39, and elsewhere) testifies to the same effect. Thus, (p. 39, folio 53) he says of the method practiced by the defendant:

> "On the other hand, there is a direct union between homogeneous materials and, as a consequence, there is

a perfect continuity in appearance as well as in fact, and there is no liability of the breaking away of the patch from the pavement by the yielding of an interposed cement. . . . There is, therefore, perfect identity between the method practised by defendants and that set forth in the patent and specified in claim 1 thereof, with respect to the nature and order of the steps involved and to the results and advantages claimed."

We submit, therefore, with entire confidence, that on the process patent the courts below were wrong, and that the decision of the Circuit Court of Appeals for the Seventh Circuit should be reversed and the case remanded to the Circuit Court with directions to enter a decree for complainant with costs.

LYSANDER HILL,
RAYMOND & BARNETT,
For Petitioner.

CHICAGO, April 11th, 1901.

PROCEEDINGS IN THE PATENT OFFICE.

A certified copy of the file-wrapper and contents of the Perkins Method Patent, No. 501,537, herein sued upon, was duly introduced in evidence (Transcript, p. 101, K).

Although this file-wrapper and contents are not reproduced in the printed record, the original exhibit, duly marked, is on file in this court.

It appears from this exhibit that the application for this patent originally contained three claims.

The first two of these were the same as the claims of the patent.

The third claim was identical with the present first claim, except that it specified a "*strong blast*" of heat. Said third claim read as follows:

"3. The method of repairing asphalt pavements which consists in subjecting the spot to be repaired to *a strong blast of heat*, adding new material and smoothing and burnishing it, substantially as described."

Thereupon certain correspondence ensued between the applicant's attorneys and the Patent Office, resulting in the cancellation of said third claim, not because applicant abandoned said third claim, but because the Patent Office held that *both claims were for the same invention, and applicant acquiesced in said action.*

This, in effect, was an agreement between the applicant and the Government that the "heat * * * *substantially as described*," specified in claim 1, is the "strong blast of heat" of claim 3; that the claims were interchangeable, and so, of course, only one of them could be allowed.

This is the action, and the only action, referred to by the circuit court of appeals of the seventh circuit as clearly indicating applicant's intention *not* to limit himself to the application of any kind or degree of heat, whereas, on the contrary, not only is applicant's first claim referred back to the specification by the words "substantially as described," but by said action in the Patent Office applicant conceded the examiner's contention that claims 1 and 3 *did not differ in their real meaning or effect.* In fact, that is the only ground upon which the office could call for the cancellation of either of said claims.

Said correspondence with the Patent Office is as follows:

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *May 9th*, 1893.
Mailed " 10 "

"Method of repairing asphalt pavements." Filed M'ch 8, 1893. No. 465,137.

Amos H. Perkins, c/o Raymond & Omohundro, Chicago, Ill.:

The above application has been duly examined.

On line 10, p. 3, applicant states that "the apparatus is provided with a handle, H, whereby the operator may readily move it," etc.

It is noted that the above letter is used to designate the handle of the air pump G, and *not* that employed in moving the apparatus from place to place, to which no reference letter has been applied.

The 1st and 3d claims are the same in substance, differing only in degree, and both cannot be permitted to remain in the case.

It seems unnecessary to remark that the process is not modified, whether the material is "subjected to heat" or "subjected to a strong blast of heat."

Either the 1st or 3d claim should be stricken out.

T. J. HUDSON, *Examiner.*

Amendment.

CHICAGO, *May* 24, 1893.

Amos H. Perkins. Method of repairing asphalt pavements. Filed March 8, 1893. Sr. No., 465,137. Application for patent.

Hon. Commissioner of Patents, Washington, D. C.

SIR: We hereby amend as follows:

The examiner is respectfully requested to cancel the reference letter from Fig. 2 of the drawing, and to change the in leading line or mark at the reference letter H, in Fig. 1, from the pump handle to the handle of the machine.

Page 2, line 6, cancel "blast" and substitute *degree.*

Cancel claim 3.

Remarks.

This application has now been amended so as to avoid the objections cited by the examiner in his last letter, and an early allowance is therefore requested.

Very respectfully,

RAYMOND AND OMOHUNDRO,
Attorneys for Perkins.